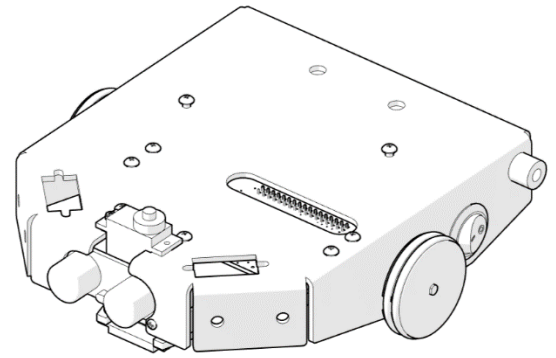


Skitter Robot for MyRIO Controller (Fall 2022)

Assembly Guide

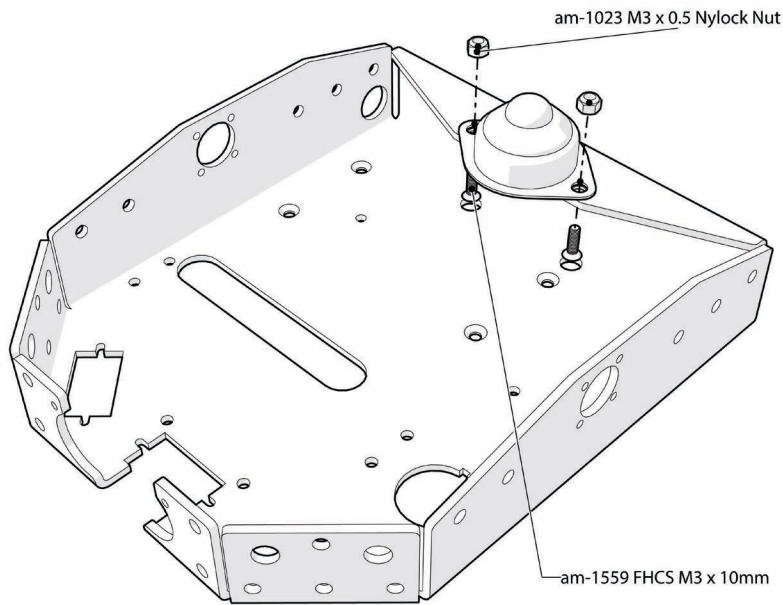


TOOLS

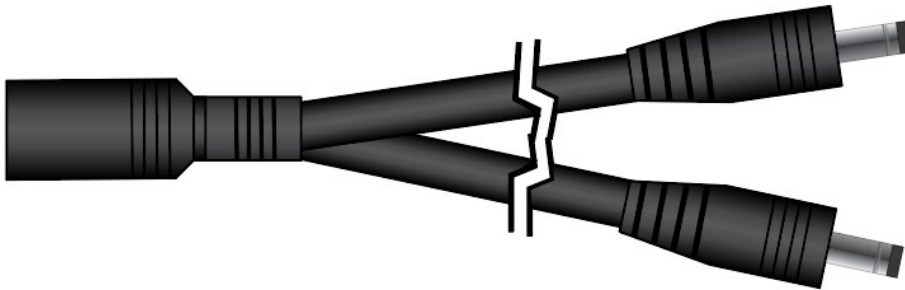
am-1287	5.5mm Nut Driver
am-2833	#2 Phillips Screwdriver
	Needle-nose Pliers (Optional)

PART #	DESCRIPTION	QTY
am-4344a	Skitter Chassis Frame	1
am-4353	Ball Caster	1
am-4342	Sensor, Ultrasonic HC-SR04	1
am-4343	Servo, SG90	1
am-4347	12V Li-Ion Battery, 3000mAh	1
am-4338	Gearmotor, 12v w/ encoder	2
ip-3797_switch	On/Off Switch	1
am-4357	Ribbon Cable, myRIO	1
am-4352	Cable, Ultrasonic	1
am-4358a	Circuit Board	1
am-4354	Wheel	2
am-4340	O-Ring	4
am-1188_1	Cable Tie, 4"	4
ip-4350a_spacer	MyRIO Spacer Tool	1
	Hook and Loop Pair	1
am-4350h	Hardware Kit	
am-1553	Screw, Pan Head M2-0.4 x 6mm	13
am-1554	Nut, M2-0.4	3
am-1556	Screw, Pan Head M3-0.5 x 6mm	8
am-1559	Screw, Flat Head M3-0.5 x 10mm	2
am-1557	Screw, Pan Head M3-0.5 x 12mm	7
am-1023	Nut, Nylock M3-0.5	11
am-1558	Hex Standoff, M3-0.5	2
am-1473	Spacer	4
	Line Follower Kit	
am-4857	Sensor, Line Following	1
am-4818	Cable, Line Follower	1
am-4730	Line Follower Sensor Bracket	1
am-1677	Screw, Pan Head M3-0.5 x 16mm	2
am-1432	Line Follower Screw Spacer	2
am-1553	Screw, Pan Head M2-0.4 x 6mm	2
am-1554	Nut, M2-0.4	2

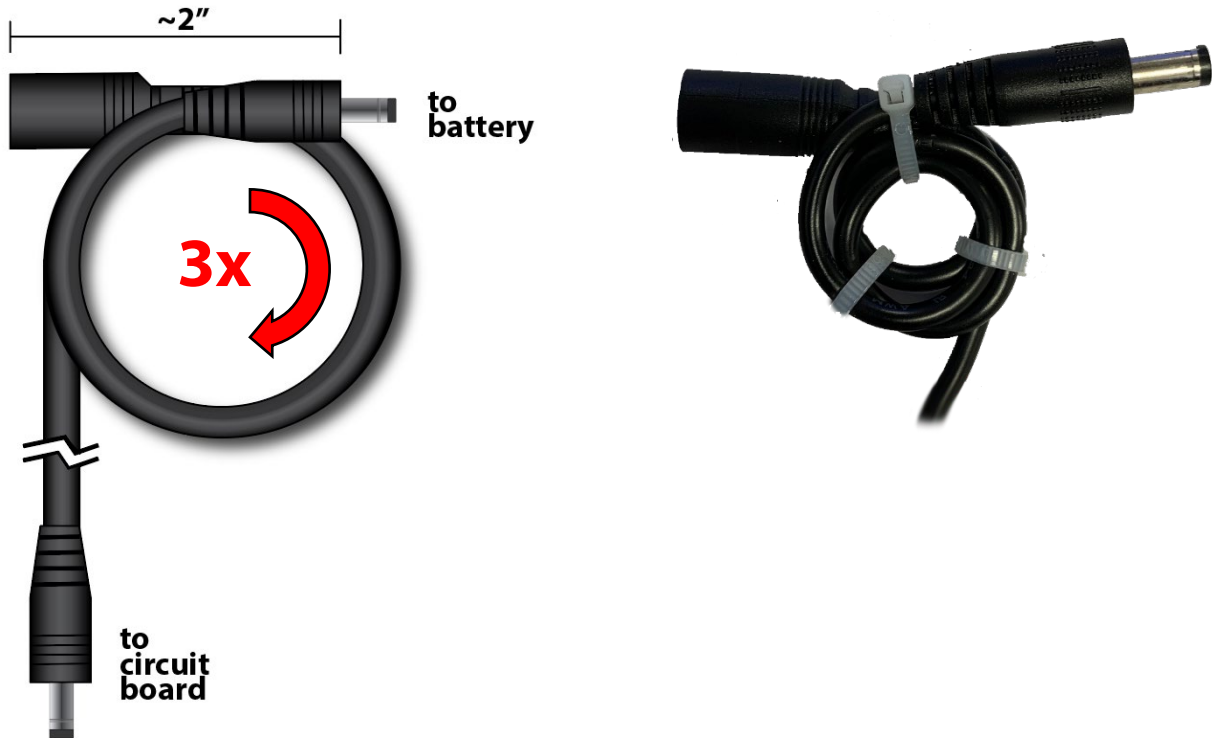
1. Install caster using two Flat Head M3-0.5 x 10mm Screws (am-1559) and two M3 x 0.5 Nylock Nuts (am-1023). The flat head of the screw should sit inside the bent flange. The screw and nut can be tightened using the access holes in the frame.



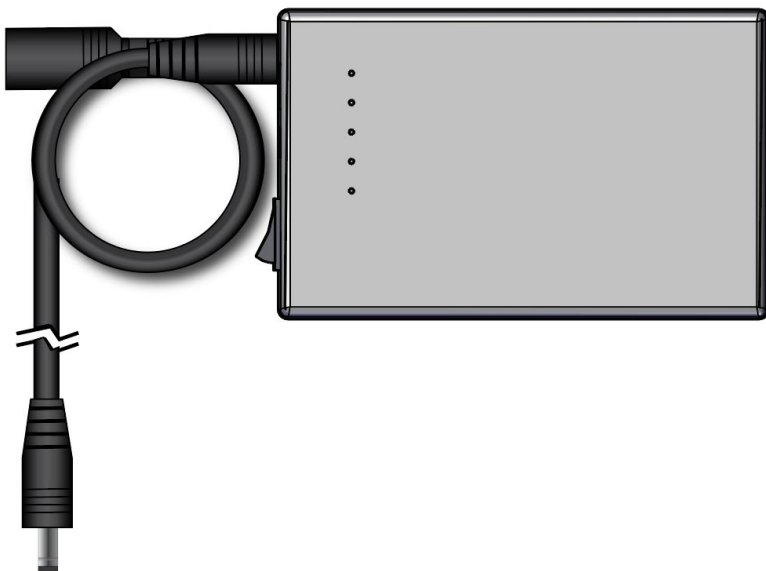
2. Locate the Battery Cable included with the Battery Pack. This cable has a female end and two male ends. The female end will be fed through a hole in the chassis for charging. One male end will go to the battery pack and the other will go to the circuit board.



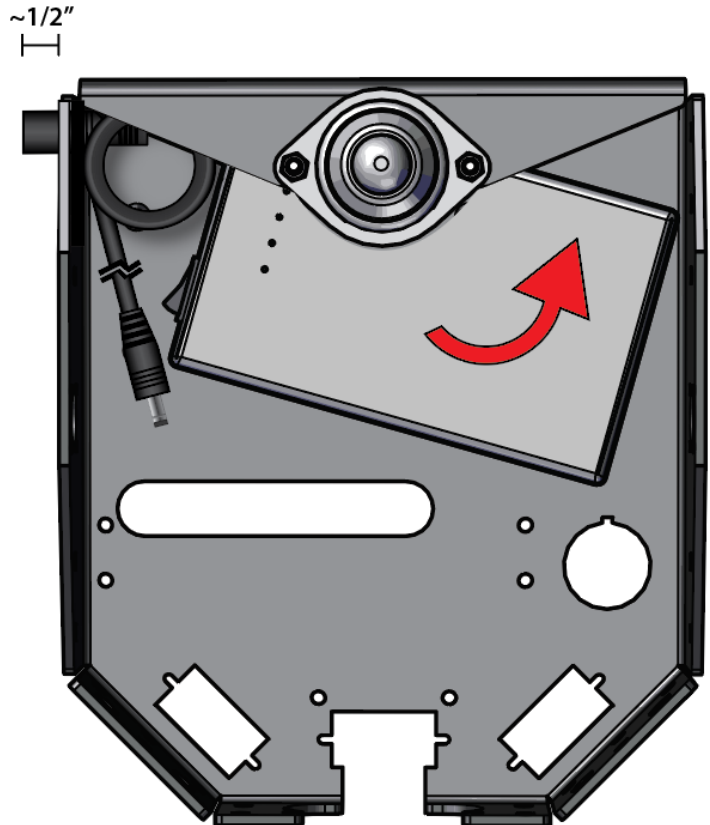
3. Wrap one end of the Battery Cable into a small loop and secure using one to four cable ties (am-1188_1). In order to fit in the space between the Battery Pack and the Frame Wall, the two cable ends will need to overlap for a total length of ~2". The smaller the loop, the easier it will fit in the chassis frame. The other male end will go to the connector on the Circuit Board and should measure approximately 6" long.



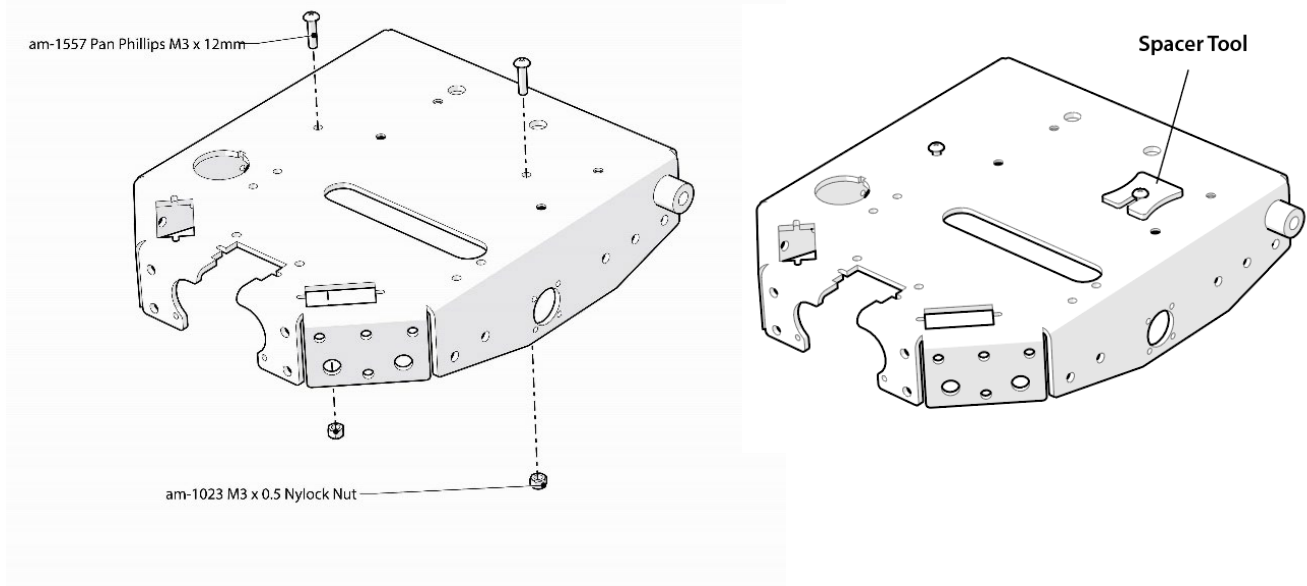
4. Plug the shorter male end of the Battery Cable to the Battery and slide the Battery into the rear right corner of the chassis. The lights on the battery should face up and the switch should be located on the left.



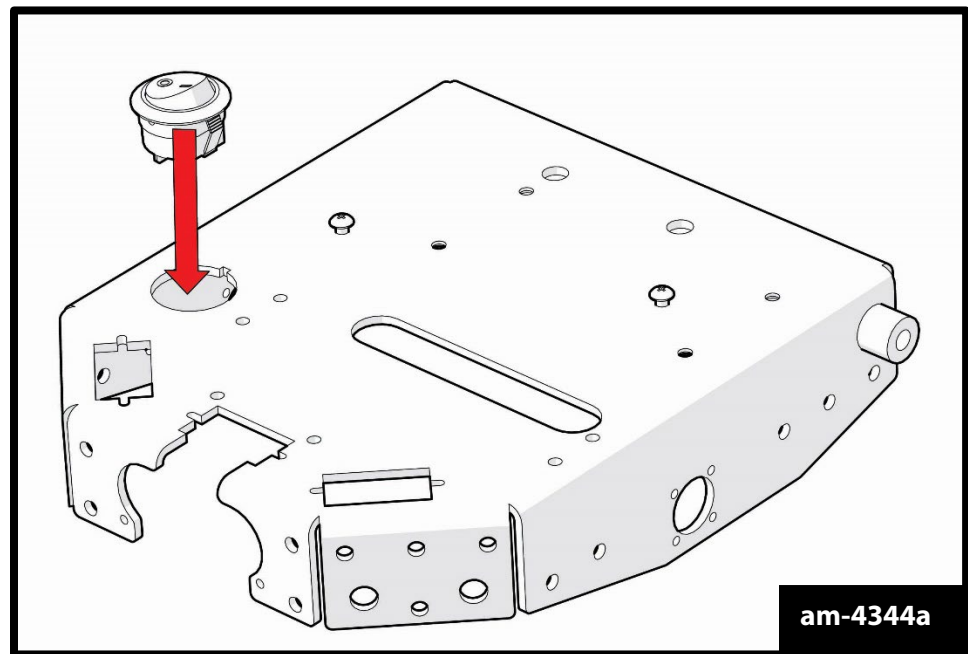
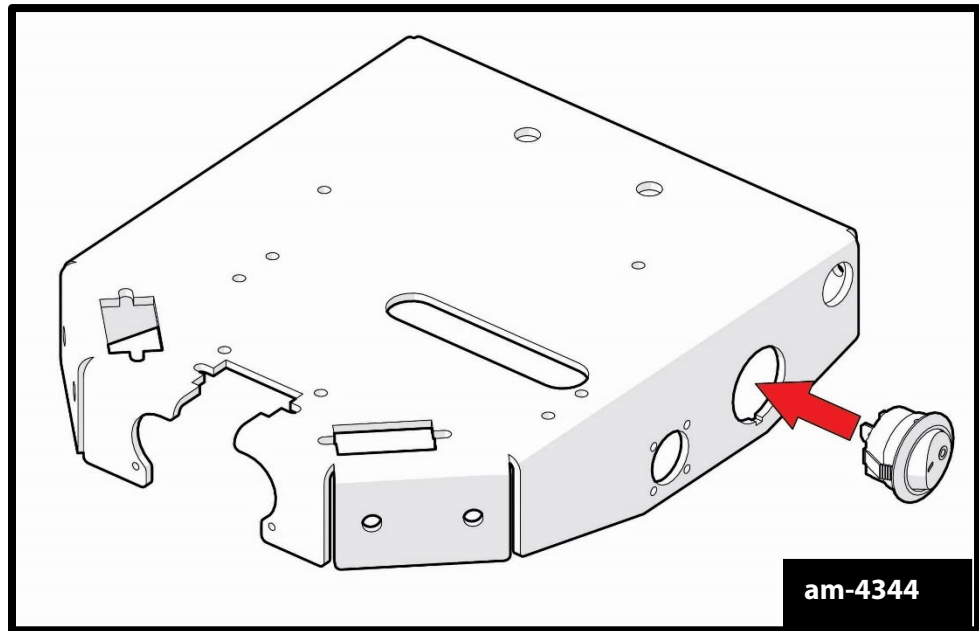
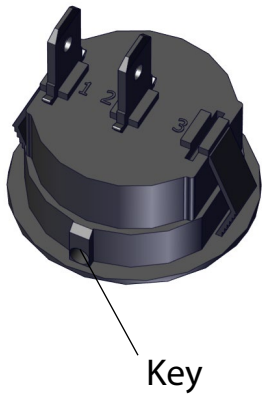
5. The battery pack sits underneath the chassis flange with the lights facing outward. To install, Insert female end of the Battery Cable into left rear hole while sliding the battery into place. The female end of the battery cable should protrude approximately $\frac{1}{2}$ " The female end of the cable is a tight fit held in by friction, you may need to wiggle the cable back and forth to get it inserted into the hole.



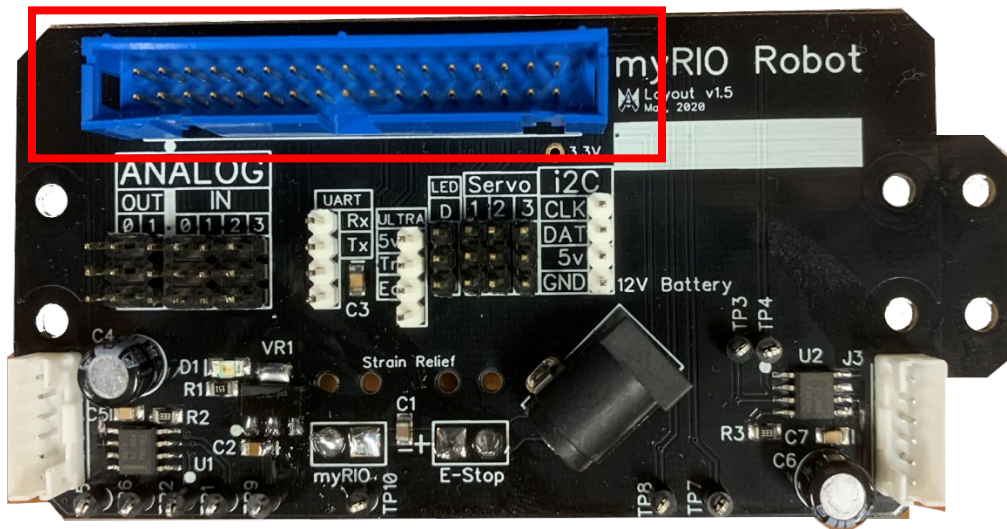
6. Flip the frame over and install two M3 x 12mm Pan Head Screws (am-1557) for MyRIO. Slide the Spacer Tool under the head of each screws while tightening the nut to secure and then remove the spacer tool. This will ensure that the head of the screw has enough clearance to engage with the MyRIO mounting holes. Alternatively, the MyRIO can be installed with the included Hook and Loop.



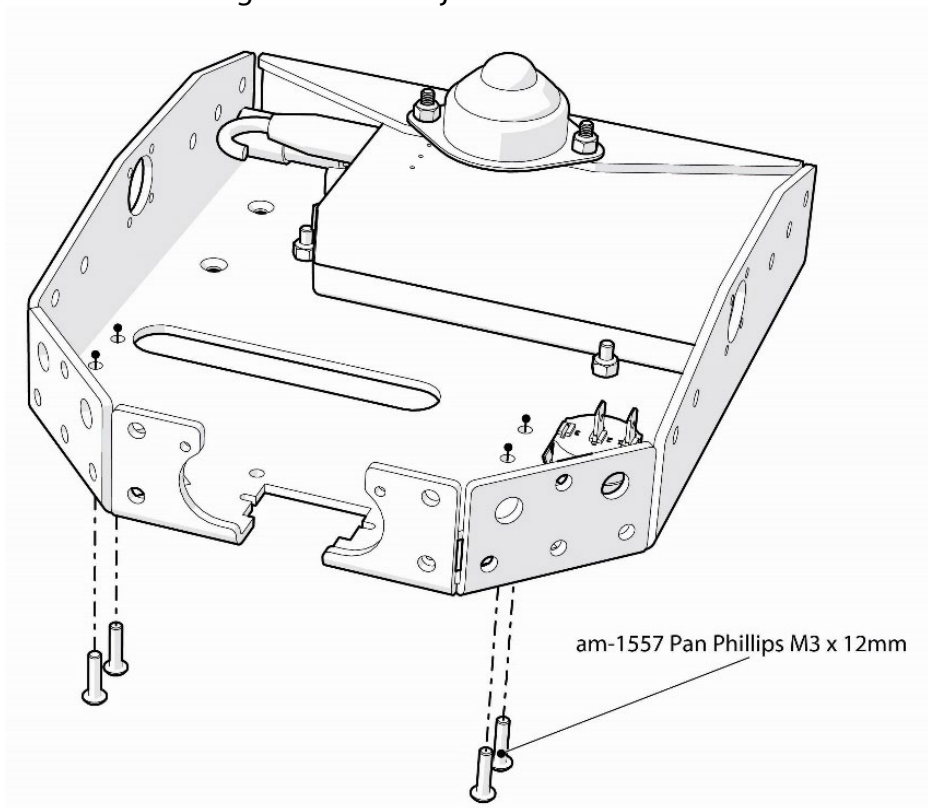
7. Snap in the On/Off Switch (ip-3797_switch) into the mounting hole in the frame. Some versions of Skitter will have the hole for the power switch on the side, others will have the hole on the top. Ensure the locating key on the switch is aligned with the notch in the frame.



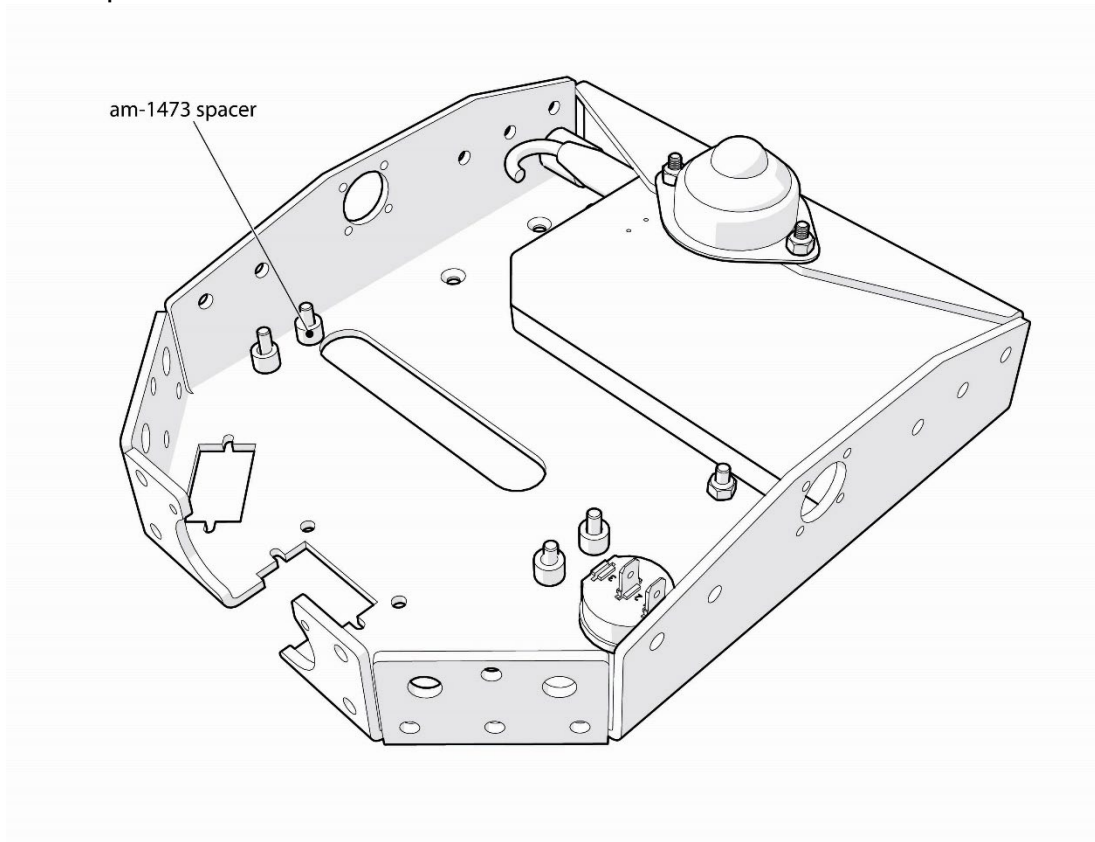
8. Prepare the Circuit Board (am-4358a) by attaching the Ribbon Cable (am-4357) to Circuit Board in the location shown. The key in the connector will only allow the cable to be plugged in one way.



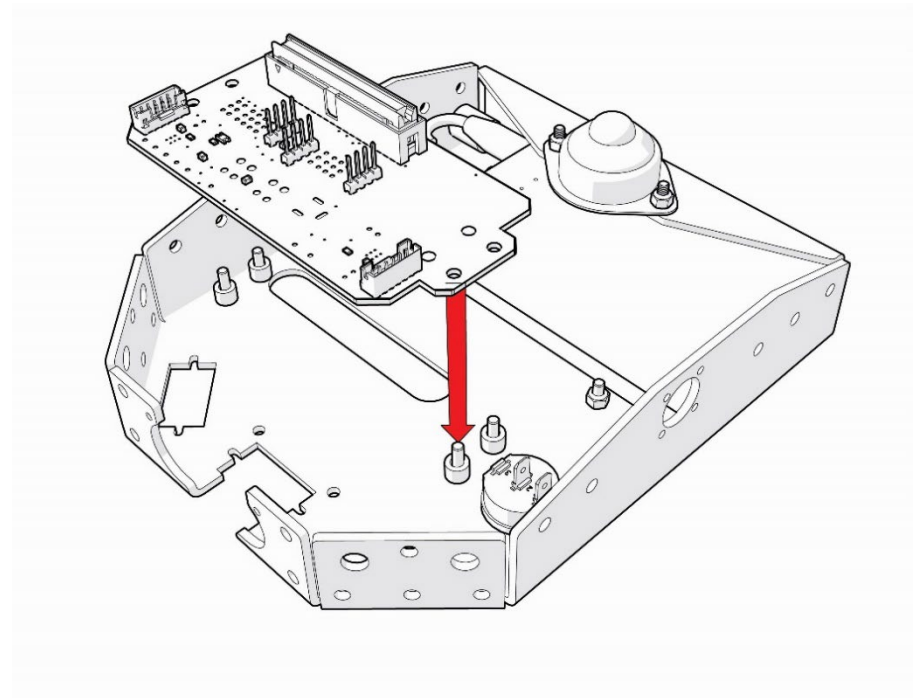
9. Flip the frame over and insert four M3 x 12mm Screws (am-1557) up through the bottom top of the sheet metal through the holes adjacent to the slot.



10. Add a Spacer (am-1473) to each screw.

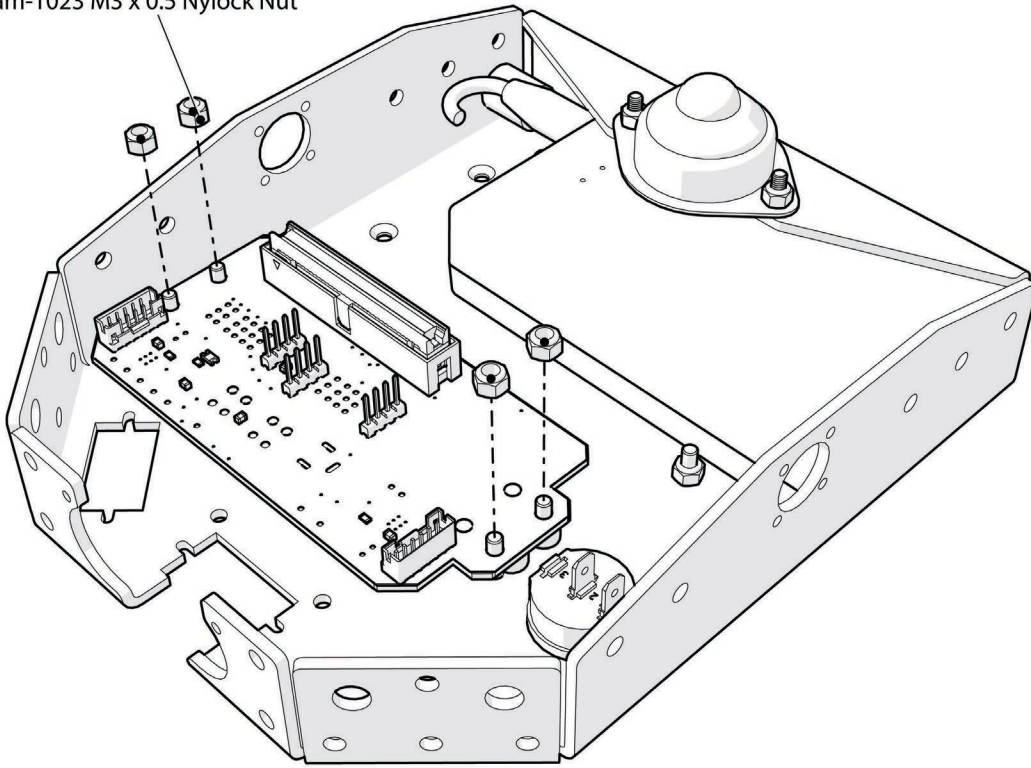


11. Ensure the Barrel Jack Power and Ribbon Cable attached to the Circuit Board for the MyRIO extend through the slot and slide the PCB onto the four screws. The ribbon cable connection should be closest to the slot.

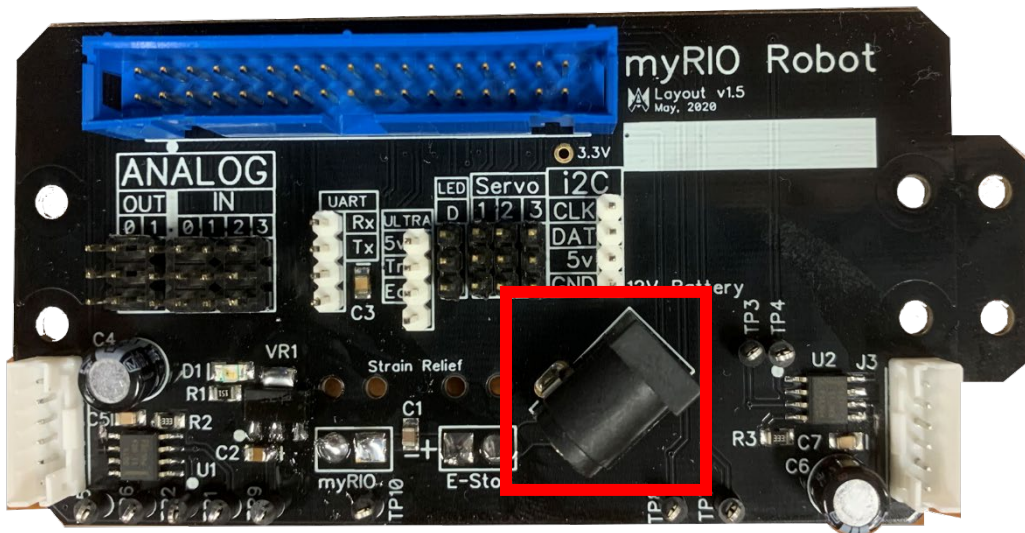


12. Secure the Circuit Board using four M3 x 0.5 Nylock Nuts (am-1023). Needle nose pliers may be needed to hold one of the nuts in place.

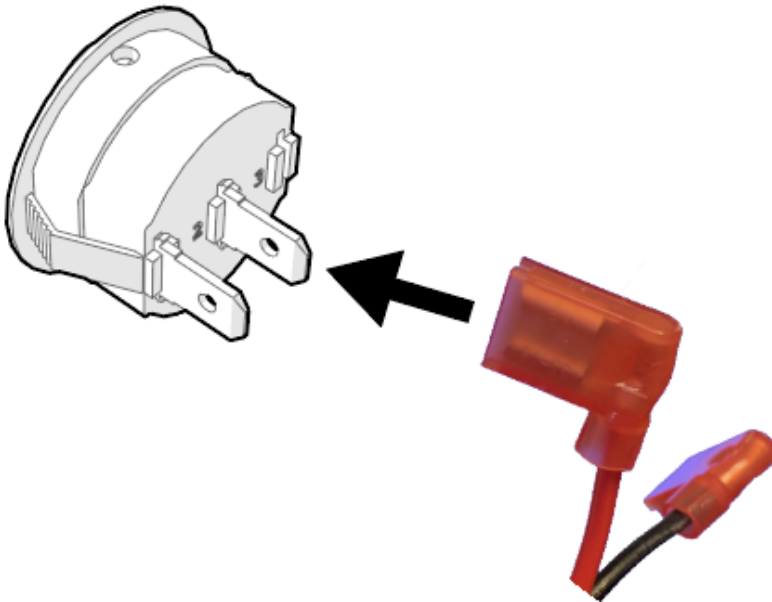
am-1023 M3 x 0.5 Nylock Nut



13. Plug in male barrel jack from the long extension from step 2 into the Circuit Board.

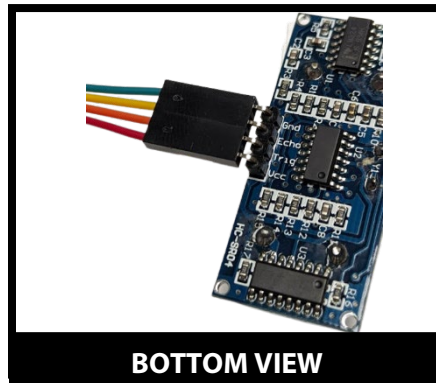


14. Slide the crimped connectors on the cable from Circuit Board onto the tabs on the on/off switch. The red or black color does not matter and can go to either tab. Needle-nose pliers may be used to gently press the connectors onto the tabs.



15. Locate the Ultrasonic Sensor (am-4342) and plug in the 4-pin cable (am-4352). The pinout is labeled on the board.

Board Label	Wire Color
VCC	Red
Trig	Orange
Echo	Yellow
Gnd	Green

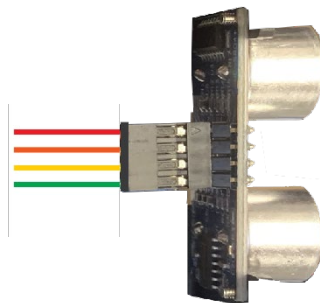


BOTTOM VIEW

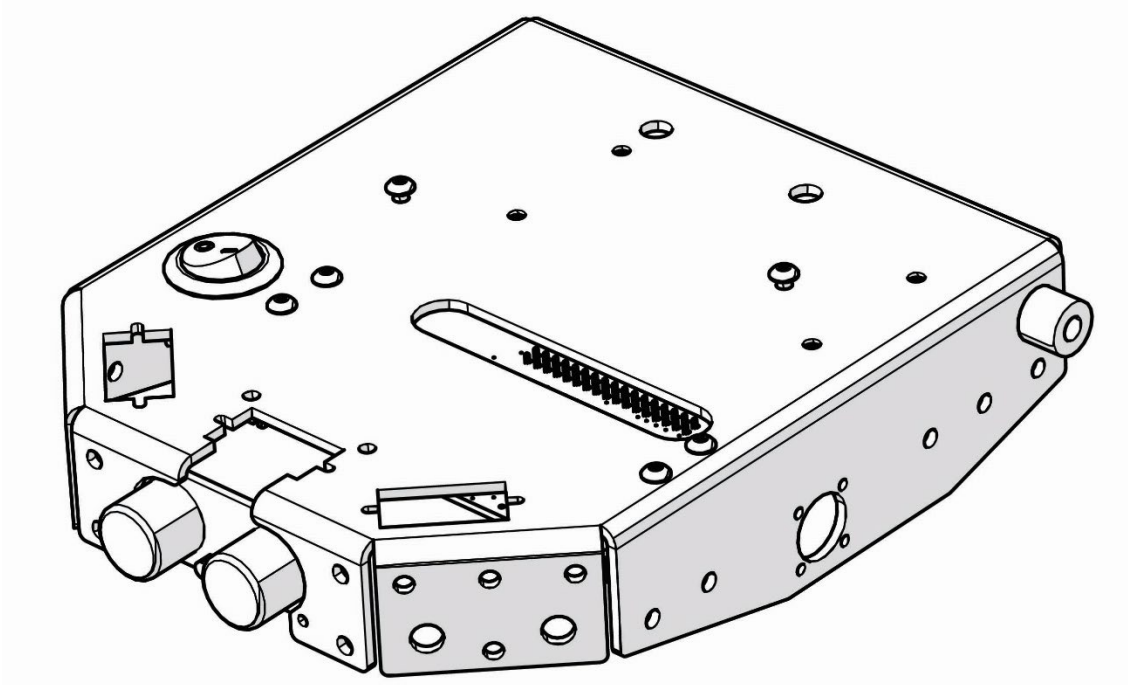


TOP VIEW

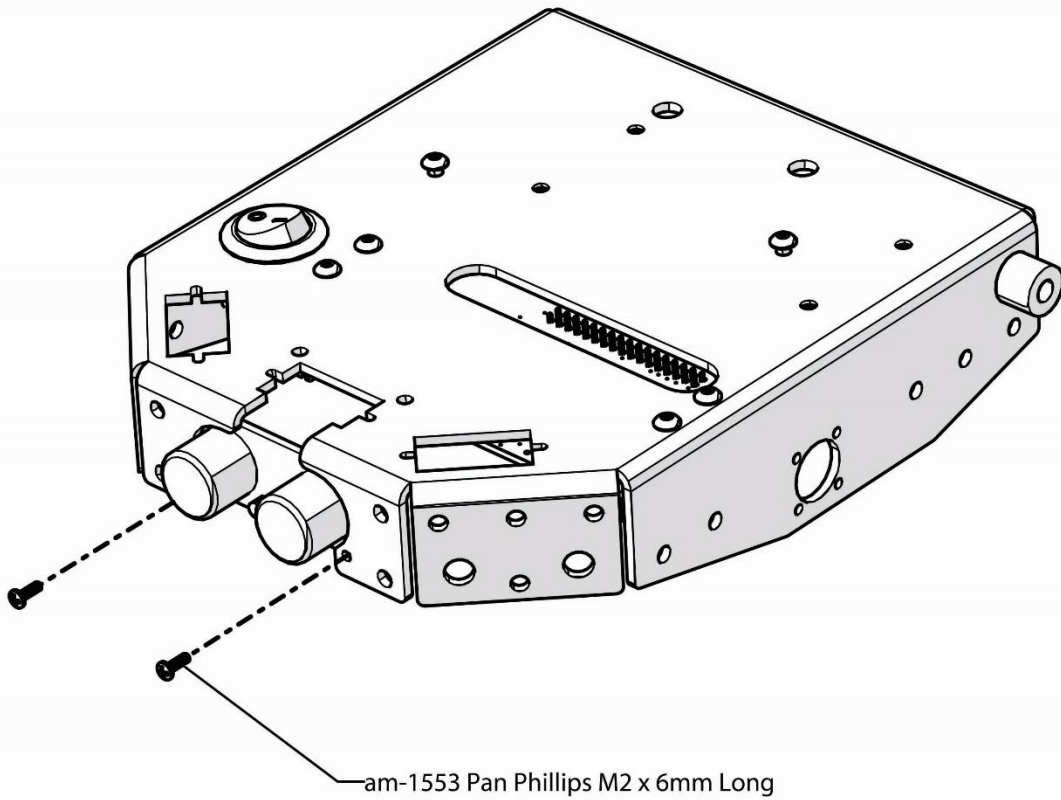
Carefully bend the pins so that the connector sits perpendicular to the board and the pins stick straight out.



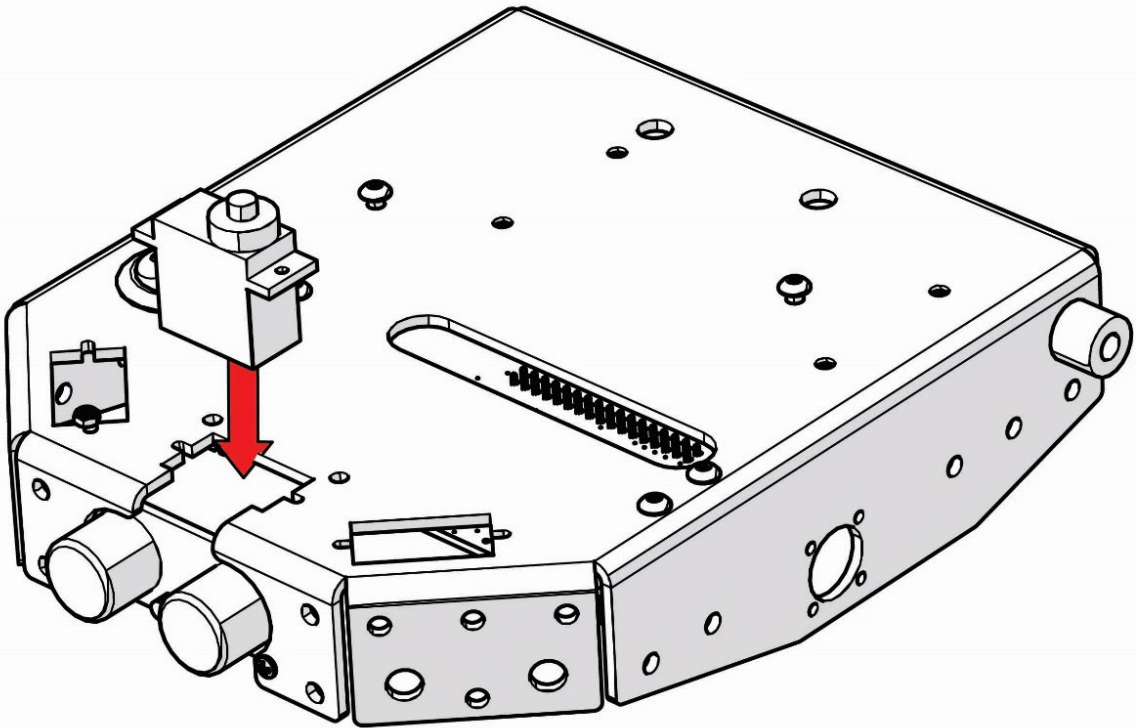
16. Insert the Ultrasonic Sensor into the slot in the front of the robot. The pins should be towards the bottom of the robot.



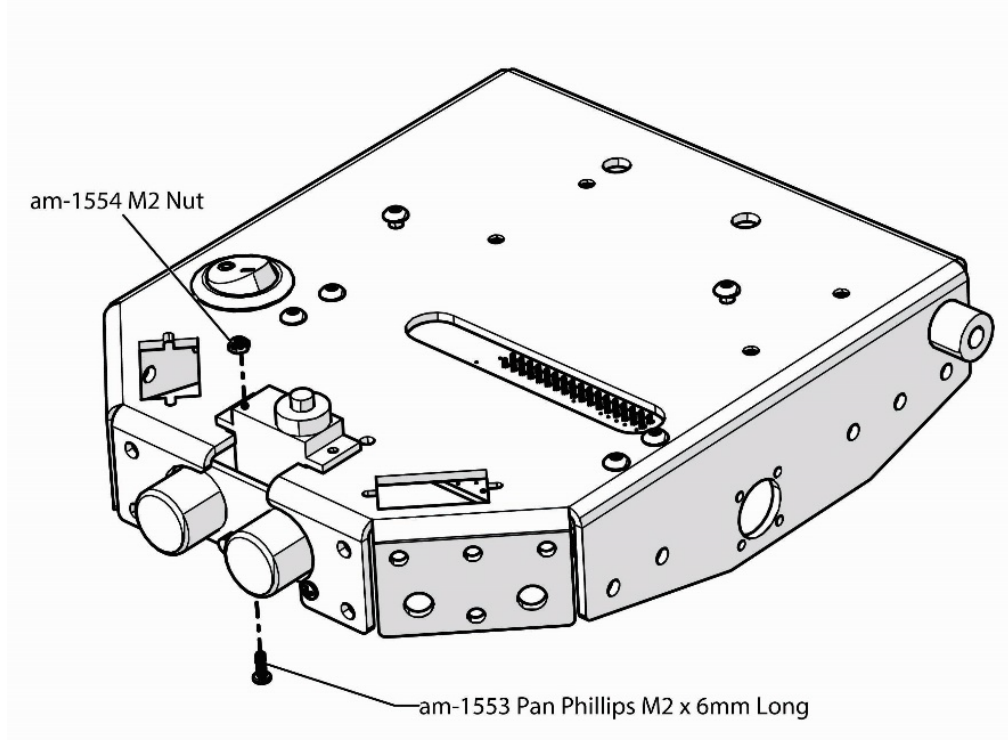
17. Install ultrasonic sensor with two M2 x 6mm Screws (am-1553). **No nuts are used, these screws thread into the circuit board.**



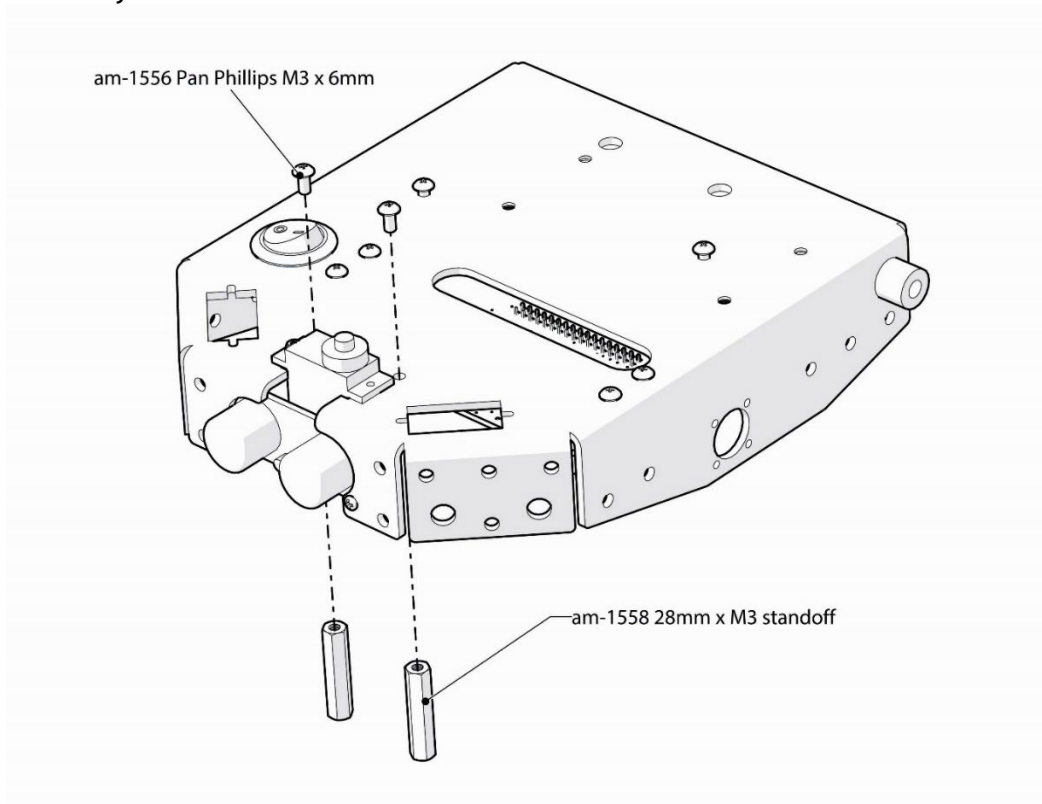
18. Insert the Servo (am-4343) into the center slot on the frame as shown.



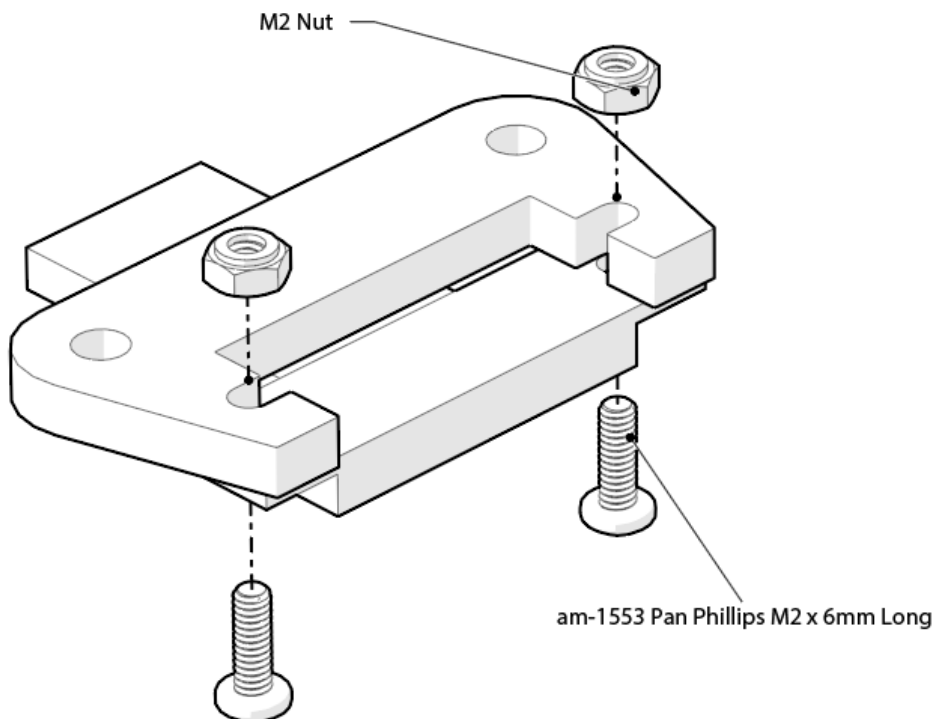
19. Attach the Servo using one M2 x 6mm Screw (am-1553) and M2 Nut (am-1554). These screws and nuts can be tightened by hand. Two of the three mounting slots will remain unused. Additional slots are available for mounting additional Servos.



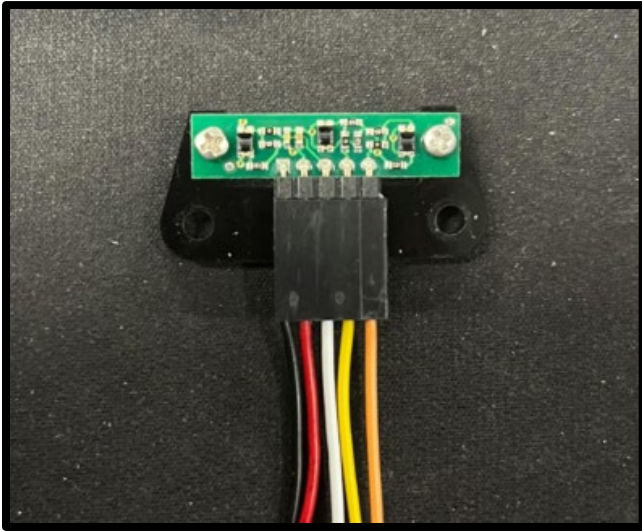
20. Mount Standoffs (am-1558) to underside with two M3 x 6mm Pan Head Screws (am-1556) in the holes adjacent to the servo as shown.



21. Attach the Line Follower Sensor (am-4857) to the Line Follower Sensor Bracket using M2 x 6mm Screws (am-1553) and M2 Nuts (am-1554).



22. Plug the 5-pin cable (am-4818) into the Line Follower Sensor Assembly. The pin-out label is located on the bottom board of the board. Use the red/black pair for 5V and GND.

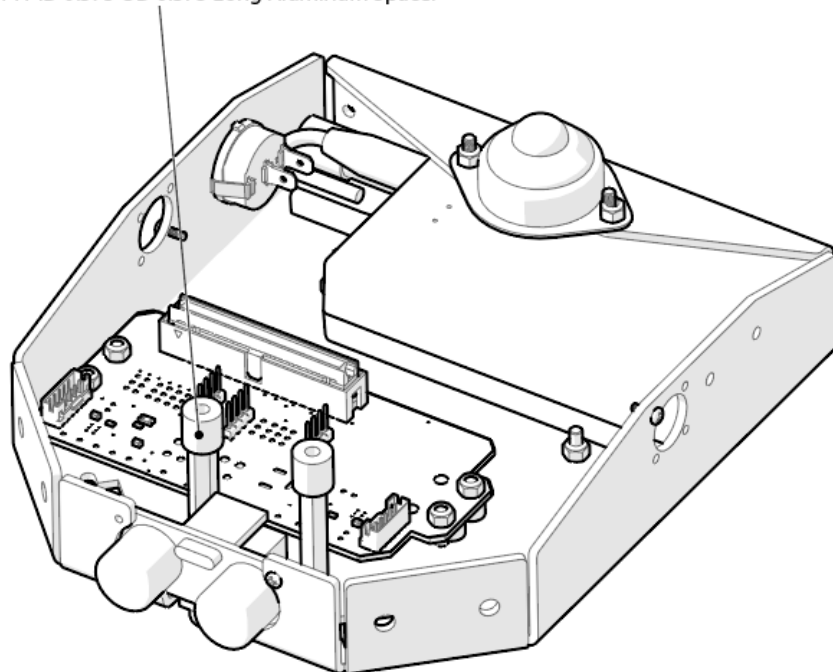


Board Label	Wire Color
GND	Black
5V	Red
1	White
2	Yellow
3	Orange



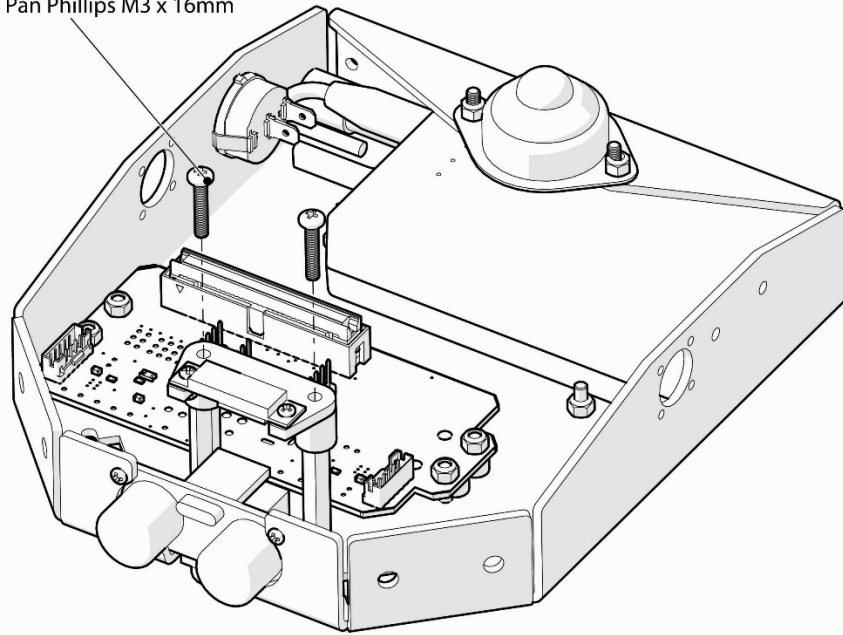
23. Flip the frame over and add the Line Follower Screw Spacer (am-1432) to each standoff. These will be secured in the next step.

am-1432 0.141 ID 0.375 OD 0.375 Long Aluminum Spacer

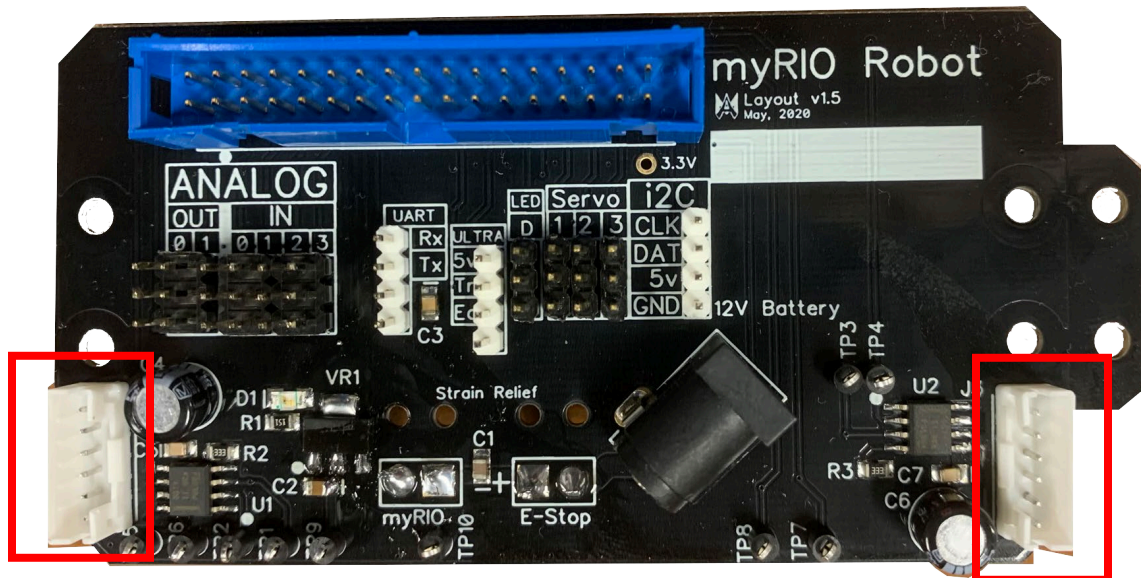


24. Secure the line follower sensor to the standoffs, through the spacer, with two M3 x 16mm Pan Head Screws (am-1677). The sensors on the circuit board should be facing outwards and away from the frame.

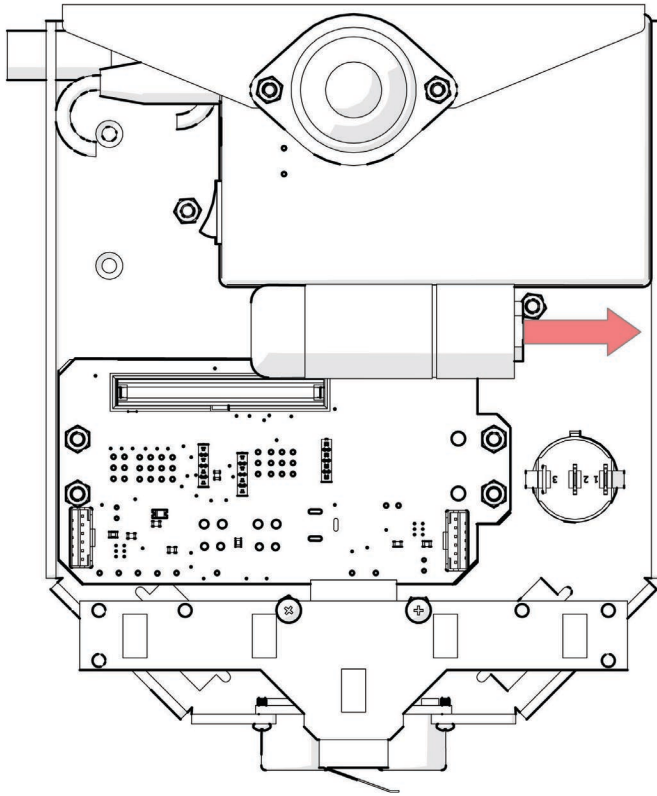
am-1677 Pan Phillips M3 x 16mm



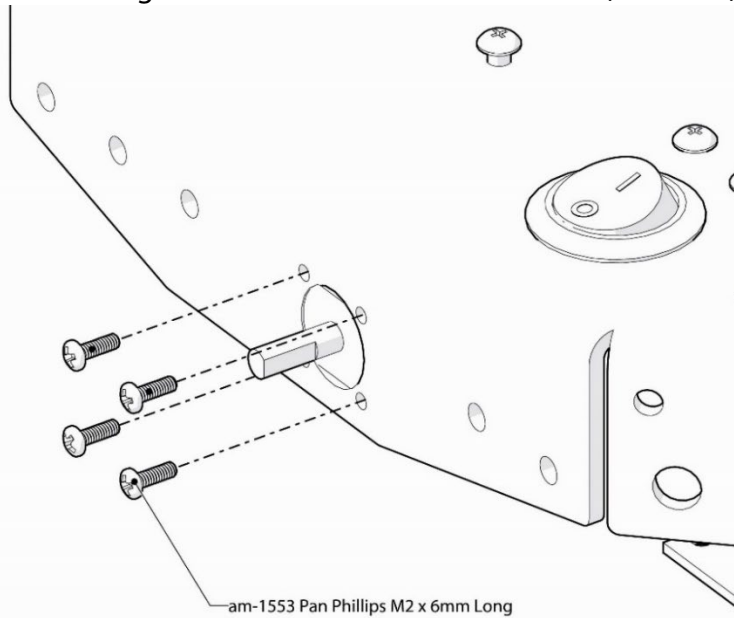
25. Plug one motor into the connector on the Circuit Board.



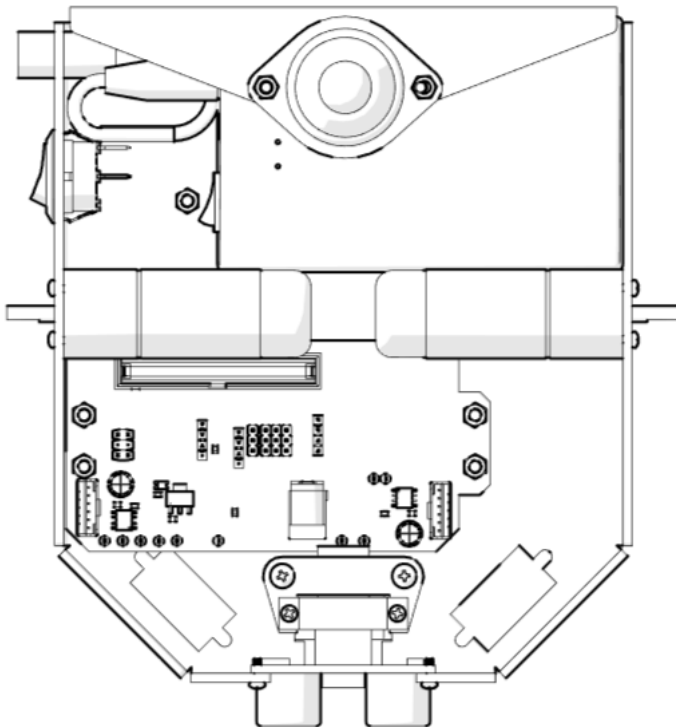
26. Align the Gearmotor (am-4338) with the hole in the side of the frame. Note: To ensure the wires are cleanly routed, rotate the Gearmotor to align with mounting holes so that the wires route under the motor but still allow for a small amount of slack for the connection to the Circuit Board.



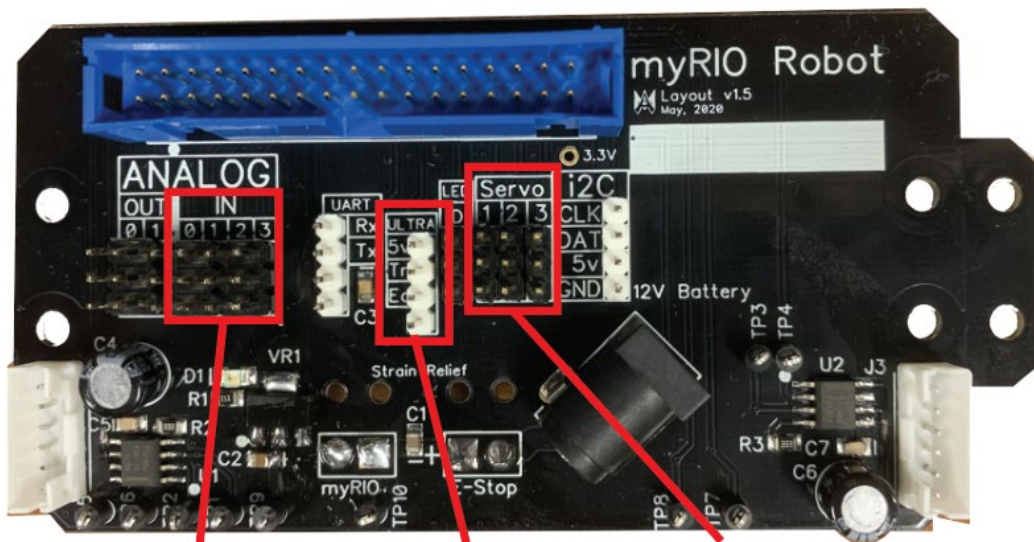
27. Install the motors using four M2 x 6mm Pan Head Screws (am-1553).



28. Repeat steps for the motor on the opposite side.



29. Plug in the Servo, Line Follower Sensor, and Ultrasonic Sensor into the connectors on the Circuit Board. For this version, only one servo is used and plugs into the "Servo 1" column.



Line Follower Sensor

IN			
0	1	2	3
W	Y	O	
R			
B			

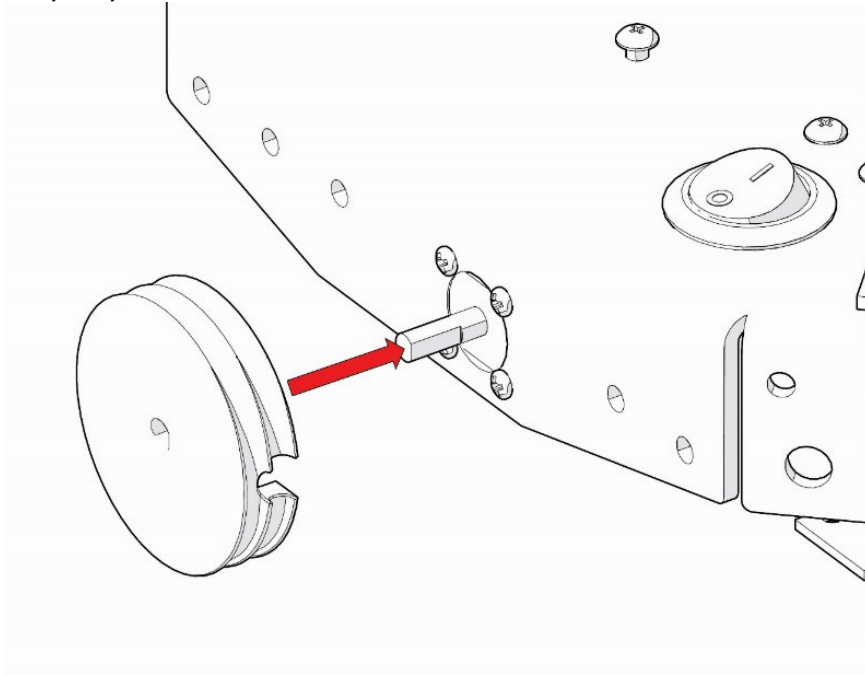
Ultrasonic Sensor

ULTRA	
5v	R
Tr	O
Ec	Y
	G

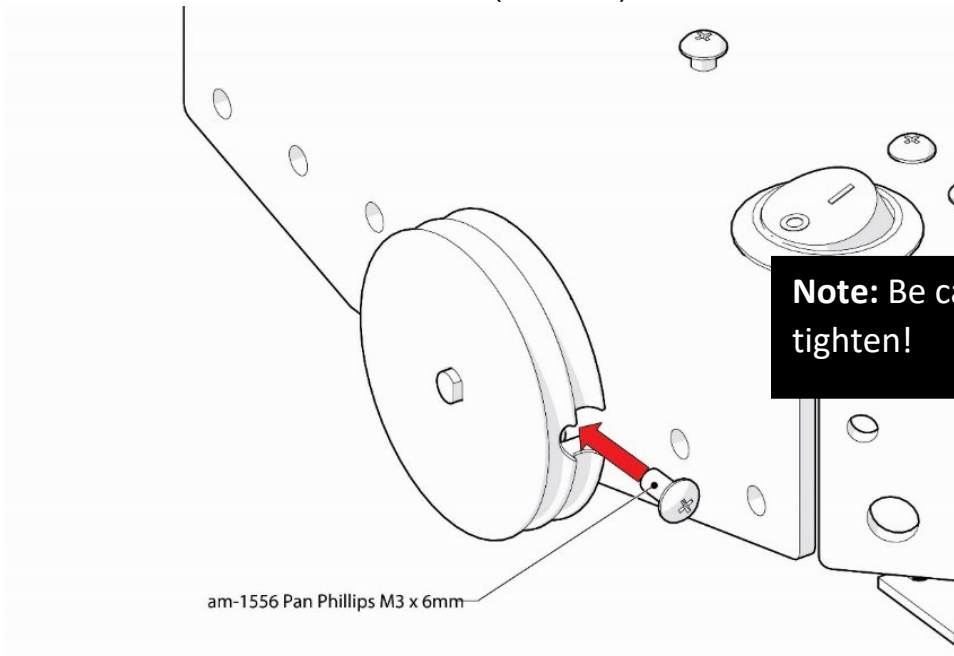
Servos

SERVO		
1	2	3
Y		
R		
B		

30. Press one Wheel onto each motor shaft. Ensure the D-shaped profile of the shaft aligns with the D-shaped profile of the wheel bore.



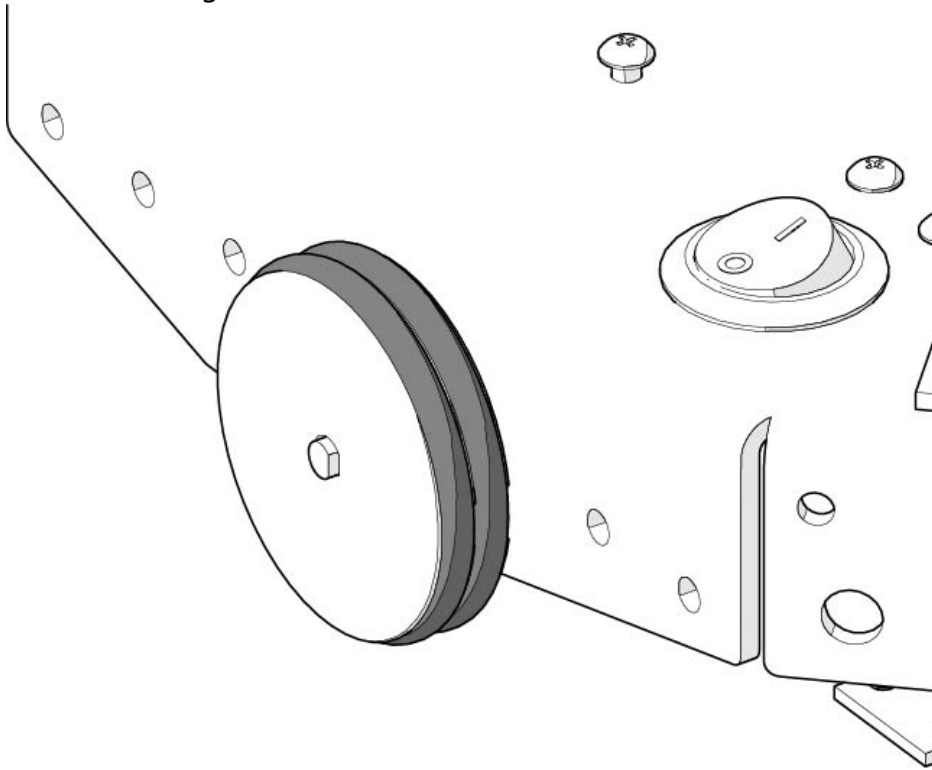
31. Add one M3 x 6mm Pan Head Screw (am-1556) to each wheel to secure axially on the shaft.



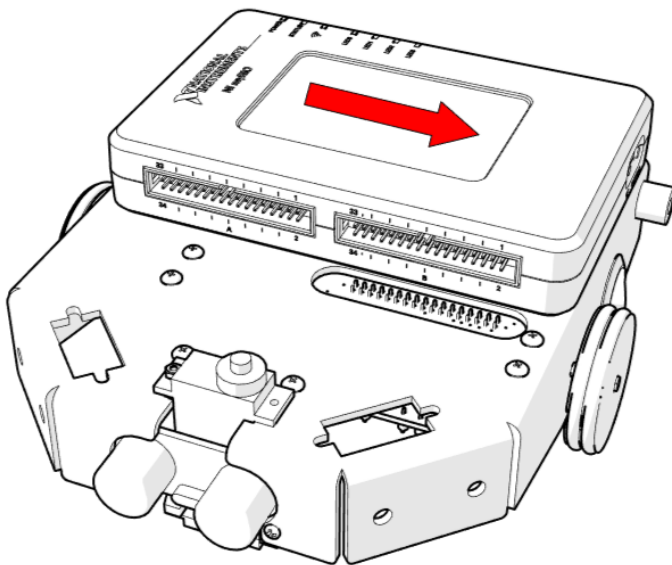
Note: Be careful not to over tighten!

am-1556 Pan Phillips M3 x 6mm

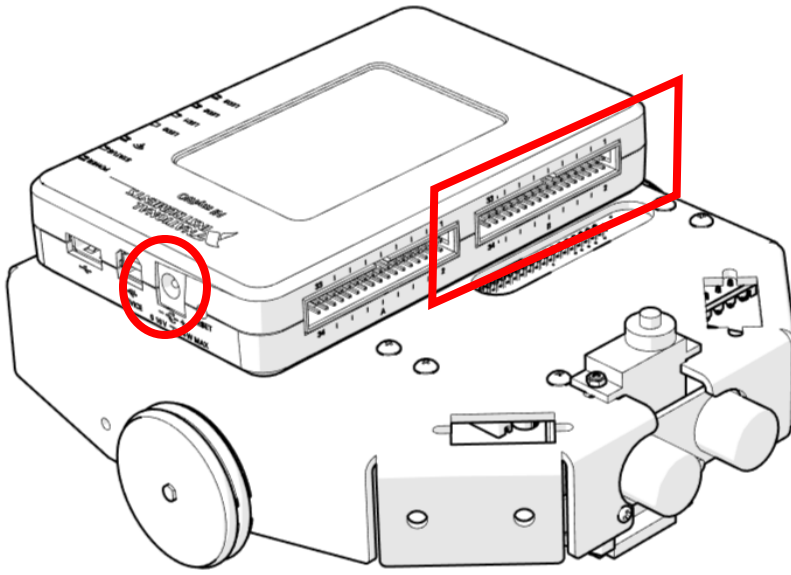
32. Add two O-Rings to each Wheel.



33. To Attach the MyRIO, hold both screws up from the bottom, place MyRIO slot over the head of the screw, and slide to lock in place. Alternatively, the myRIO can be attached with the included hook and loop.



34. Plug the ribbon cable and the power cable that were fed through the slot in a previous step into the myRIO. Your Skitter is Complete!



Note about charging:

- Charge before use.
- Only use provided charger.
- Ensure robot and myRIO are both turned off completely.